

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of

Amendment of Section 90.239 of
the Commission's Rules to Adopt
Permanent Regulations for
Automatic Vehicle Monitoring
Systems

RM-8013

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FEDERAL COMMUNICATIONS COMMISSION
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TO: The Commission

PETITION FOR CLARIFICATION AND LIMITED RECONSIDERATION

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SUMMARY OF RELIEF REQUESTED

Texas Instruments Incorporated ("TI") and MFS Network Technologies, Inc. ("MFS") (collectively referred to as "TI/MFS") seek two forms of relief. First, TI/MFS request that the Federal Communication Commission ("Commission") modify its proposed Report and Order that was released on February 6, 1995, (the "Ruling") regarding Automatic Vehicle Monitoring Systems ("AVM Systems") in one very limited respect, modifying the frequency tolerance limit ("FTL") of .00025 percent (or 2.5 ppm) for non-multilateration systems. Second, TI/MFS request that the Commission issue clarifying statements regarding whether the calculation of the emission mask limit includes or excludes antenna gain in the equation and confirming that the Commission understands that the calculation could yield a limit of -55 DbW.

TI/MFS recognize that the primary purpose for adopting the frequency tolerance limit was to avoid interferences. TI/MFS respectfully submit that other technical specification limits in the Ruling, technical limitations inherent to the AVM non-multilateration technology, and the final bandwidth allocation plan adequately protect against interference between: i) non-multilateration systems and multilateration systems; ii) non-multilateration systems sharing the bandwidth; and iii) non-multilateration systems and Part 15 users, rendering the FTL, a cost-prohibitive requirement, only of *de minimus* value for avoiding interference. Moreover, because these other aspects of the Ruling and the practicalities of the technology sufficiently guard against interference, the relaxation of the FTL for non-multilateration systems will have no adverse impact on any of the interested parties represented in this rulemaking process; nor, will the relaxation favor one

non-multilateration provider over any other non-multilateration provider. The increased cost and delay that would be associated with creating additional equipment necessary to make AVM Systems conform to this frequency tolerance could jeopardize funding for pending projects and allocations for new projects. On the other hand, the relaxation of FTL for non-multilateration systems will facilitate cost-effective and timely introduction of AVM Systems, increasing state and national revenue collection and traffic management efficiencies

As for the request for clarification, the Ruling does not specify whether the power element in the emission mask calculation is a limit tied to the power before or after antennae gain in a directional antennae system. TI/MFS seek confirmation from the Commission that the Commission realizes that the $55 + 10\text{Log}(P)$ calculation may result in an emission mask calculation that is negative and to consider whether the limit should be stated simply as -55 DbW for systems.

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PETITION FOR CLARIFICATION AND LIMITED RECONSIDERATION

Pursuant to Section 1.429 of the Commission's rules, 47 C.F.R. §1.429 (1994), Texas Instruments Incorporated ("TI") and MFS Network Technologies, Inc. ("MFS") (collectively referred to as "TI/MFS") respectfully submit this Petition for Clarification and Limited Reconsideration in response to the Federal Communication Commission ("Commission") Report and Order released February 6, 1995 (the "Ruling"), regarding permanent rules for automatic vehicle monitoring ("AVM") systems operating in the 902 MHz to 928 MHz band. TI/MFS respectfully assert that the proposed frequency tolerance limit ("FTL") of 2.5 PPM for non-multilateration systems is not mandated by performance criteria, is not necessary in addition to the other limitations to avoid interferences, and is detrimental to governmental, private sector and public interests. Accordingly, TI/MFS propose that the FTL be relaxed for non-multilateration systems to a tolerance level in the

range of 50 ppm to allow all current industry providers to continue to market cost-effective products.

Further, TI/MFS would seek clarification of the Ruling as to calculation of the emission mask.

I. BACKGROUND

Both state and national governmental agencies have championed development and rapid deployment of Intelligent Traffic Systems ("ITS") to maximize revenue collection, increase efficiencies in both the public and private sectors, minimize traffic congestion and optimize highway safety. Government policymakers and individual citizens understand that improved transportation facilities and management are essential to reducing travel time, air pollution, fuel use and enhancing the safety and efficiency of our roadways. This, in turn, opens greater access to jobs, schools and housing. The interest in ITS and the peak market for ITS systems is at hand. To further plans for investment in ITS, the federal governmental agencies have requested record levels of funding based on present cost analysis of systems for implementation in the near term. Neither the market nor the public can afford a delay in introduction of technology or the cost increases driven by the FTL.

TI/MFS recognize that this rulemaking proceeding has been pending for several years and anxiously seek its rapid conclusion. TI/MFS applaud the Commission's ardent undertaking to resolve complex issues in the 902-928 MHz band and issuance of a reasonable compromise bandwidth allocation plan. For these reasons, TI/MFS seek only limited reconsideration and ask that the Commission consider the history of this

proceeding in assessing whether a frequency tolerance proposal made during a period of time where there was substantial bandwidth to be shared between multilateration and non-multilateration systems makes sense when the bandwidth allocation has dramatically changed.

TI/MFS are players in the ITS arena. Among TI's many businesses is the Texas Instruments Registration and Identification System ("TIRIS™"), a highly cost-effective and reliable AVM system that electronically controls, detects, and tracks a variety of items using radio frequency identification ("RFID") technology. TIRIS™ is a non-multilateration system. TI has joined its efforts with those of MFS, a major telecommunications network and systems integrator and facilities manager. Specifically, TI has combined its innovative technology with MFS' telecommunications, highway systems integration, and extensive road development experience to develop intelligent highway systems that will pave the way for safer and congestion-free "smart highways" of the next century. TI/MFS through numerous trials both in the U.S. and overseas have proven the TIRIS™ technology, have pending projects in construction, and stand poised for prompt entry into nationwide deployment efforts.

TI/MFS plan to integrate the TIRIS™ technology into advanced electronic toll and traffic management ("ETTM") systems for implementation on highways, bridges, and tunnels nationwide. The ETTM system consists of a High Frequency Transponder that is a battery-powered Read-Write tag capable of communicating large amounts of information at very high speeds. The TIRIS™ system is based on modulated backscatter technology by which low level radio frequency signals are emitted from a reader to an

antenna which broadcasts the signal in a downward conic-type pattern toward the road surface. When a tag enters the cone, the reader signals are reflected back by the tag modulated by information stored in the tag's memory.

Placed on a dashboard or attached to a license plate, the tag, roughly the size of a credit card, carries a unique programmable identification code. As drivers pass under the overhead TIRIS™ radio frequency reader in a designated toll collection area, the system automatically assesses the appropriate charge to either a pre- or post-payment user account maintained by toll agency computers. Through each tag's unique code, the reader can distinguish vehicles traveling in separate lanes within 60 centimeters of each other and can even identify individual motorcycles riding side-by-side in a single lane.

Yet, like the other non-multilateration providers, TI/MFS' efforts to construct and deploy additional systems in the near term will be impeded by the FTL. The current state-of-the art across the market for non-multilateration systems is simply not sufficient to produce cost-effective systems that would comply with a FTL of 2.5 ppm. To provide conforming systems, the providers of non-multilateration systems will have to undertake substantial redesign efforts, undertake new sourcing efforts, and grapple with the dilemma of open commitments. This situation leads TI/MFS to ask the question ... to what end? The FTL is not a performance driven need, adds no substantial benefit to interference avoidance efforts and materially increases costs jeopardizing existing programs.

II.
THE TECHNICAL LIMITATIONS IN THE RULING SUFFICIENTLY
GUARD AGAINST INTERFERENCE, RENDERING THE MARGINAL
GAINS OFFERED BY THE FTL COST PROHIBITIVE FOR NON-
MULTILATERATION SYSTEMS

As the Commission noted in its Ruling, numerous parties to the rulemaking process asserted that the FTL did not make sense for non-multilateration systems and should not be imposed on those systems. Even North American Teletrac and Location Technologies ("Teletrac") suggested that existing non-multilateration systems imposing no current interference problems be grandfathered. Notably, due to the flux in the band allocation proposal, no prior commentors were in a position to provide the Commission with an explanation as to why the FTL does not effectively further the goal of minimizing interferences given the new band allocation plan. TLMFS will attempt to provide such an explanation.

A. The Technical Configuration and Operation of Non-multilateration Systems Pose No Substantial Risk of Interference with Other Non-multilateration Systems or Part 15 Users in the Same Bandwidth.

The Commission has already recognized that there is not a significant interference issue between non-multilateration providers and between non-multilateration systems and Part 15 users.

1. Current State-of-the Art AVM Non-multilateration Systems Successfully Operate Without Tangible Interference Problems With Tolerance Levels of Up to 50 PPM, Obviating the Need for Tighter Tolerance Levels at 2.5 PPM.

Upon information and belief, there are no current AVM non-multilateration systems in operation that conform to the 2.5 PPM frequency tolerance. Instead, most of the state-of-the art technology operate at tolerance levels no greater than 50 PPM. Yet,

despite this vast difference between current utilization and the new FTL, as the

Commission noted:

We are adopting our proposal to license non-multilateration LMS systems on a shared basis because these systems generally cover relatively short distances, and licensing based on a fixed mileage separation would limit re-use of spectrum and thereby limit the potential uses of these systems. We also decline to designate a frequency coordinator for this service. Many non-multilateration licenses have been issued and many stations have been placed in operation without such a formal coordination process and there appear to be no negative consequences. Considering the limited coverage of these systems and the expanded amount of spectrum available under the allocation plan we have adopted, it should not be difficult for non-multilateration systems to share their sub-bands.

Ruling at p. 36.

Since history shows that the FTL is not a performance driven criteria as between non-multilateration systems because systems are functioning with substantially lower tolerance levels without apparent consequence, the only reason for a non-multilateration provider to support the FTL, would be to gain market advantage for an existing complying system to the detriment of other providers who will suffer the delay to market. Certainly, one of the Commission's underlying purposes in pursuing this rulemaking was to increase both available technology and potential players in the market. Because the imposition of the FTL will have the opposite effect, it should be modified to a level that will not artificially exclude any current competitors from the market. TI/MFS suggest that an FTL of 50 ppm would advance the goals of the Commission without jeopardizing the industry or favoring any one competitor in that industry.

2. Antenna Configuration, Antenna Height Restrictions and Maximum Effective Emission Distances of Yards Effectively Minimize Interference With Non-multilateration Systems and Part 15 Users.

As already in place, without incorporation of the elements of the Ruling, because non-multilateration AVM systems operate only over very short distances and are highly spectrum efficient, they pose virtually no interference threat to other AVM systems or unlicensed Part 15 devices. Sufficient protections from interference are already in place through other mechanisms of the Ruling. The Ruling prescribes that antennas for non-multilateration systems may be placed no higher than 10 meters above the ground. The Ruling also prescribes an effective radiated power of 30 watts over the licensee's authorized bandwidth and requires an emission mask when near the edges of the authorized bandwidth of $55 + 10\text{Log}(P)$. Given these restrictions and the downward direction of the signal toward the road surface, the typical radius of non-multilateration system emission will be only yards from the antenna. This means that the effective area of potential interference is only when another signal attempts to transmit inside a cone 10 meters high with similarly a base diameter of only yards. As the Commission noted, "[r]educing the maximum power and antenna height of non-multilateration systems will allow non-multilateration systems to share spectrum more easily with other non-multilateration systems and with users of Part 15 devices and will permit greater frequency reuse for these systems." Ruling at p. 48. Having substantially resolved interference concerns through these other mechanisms, the minimal additional gain driven by the FTL is not offset by the fiscal or social costs associated with imposing these requirements.

B. The Elimination of Shared Bandwidths For Multilateration and Non-multilateration Systems Minimizes Interference Between These Systems.

The "lone wolf" supporting the FTL for non-multilateration systems was Teletrac.

At the time that Teletrac proposed the FTL, it was contemplated that the bandwidth allocation scheme would result in bandwidths shared by multilateration and non-multilateration systems and, due to the tolerance requirements of Teletrac's multilateration systems, there was a concern regarding interference between multilateration and non-multilateration systems in the shared bandwidths absent a frequency tolerance specification.

The bandwidth allocation plan adopted in the Ruling does not provide for shared bandwidth between multilateration and non-multilateration systems except in the narrow 2MHz width between 919.750 - 921.750 MHz. Accordingly, the catalyst for the FTL for non-multilateration systems is no longer a substantial concern. Moreover, even as late as March of 1994, Teletrac itself was supporting grandfathering for narrowband systems with no interference problems. See, Comments of Pactel Teletrac, dated March 15, 1994, at p. 14.

Even when the proposal was for much more significant band sharing, Hughes pointed out in July of 1993 that the tight frequency tolerance for non-multilateration systems while technically feasible would entail design effort and significant cost not sufficiently offset by the gains to avoiding interference. See Reply Comments of Hughes Aircraft Company, dated July 29, 1993, at pp. 9-10. Specifically, Hughes noted that: "... it would be even less appropriate to apply any frequency stability requirement upon

mobile tags, which operate at power significantly below 1 watt.”¹ *Id.* at p. 10, n.5. TLMFS reiterate the cautions raised by Hughes and suggest that the Commission’s limitation of the potential area for interference to a 2MHz range in and of itself suffices to guard against the interference concerns between multilateration and non-multilateration systems, justifying at least relaxation of the FTL.

C. The Emission Mask to be Used on The Edges of Bandwidths Sufficiently Avoids Interference Between Multilateration and Non-multilateration Systems.

Even if the narrowing of the shared bandwidth were not sufficient of itself to protect against interference between multilateration and non-multilateration interference, the emission mask operates to further minimize the potential for interference because it reduces the effective emitted power outside of the non-multi bandwidth to minus 55 dbW which is a level not likely to yield interference. As the Commission indicated: “Limiting base and mobile stations power levels will reduce the potential for interference between co-channel multilateration systems and will reduce the likelihood of interference to any other operations in the 902-928 MHz band.” *Ruling*, at p. 48. Having taken these steps, the addition of the FTL provides little, if any, gain to the goal of avoiding interference between non-multilateration and multilateration systems. Because there is little to be gained by such a stringent FTL and complying with such a strick FTL will prove cost-prohibitive, the FTL should be relaxed. Alternatively, if the Commission is not inclined to relax the FTL, then a grandfathering provision should be included for non-multilateration systems both currently in place and expected to be installed prior to a

¹ The TIRIS™ system is a system employing mobile tags.

reasonable period of time for development, qualification and testing of the necessary equipment to meet the 2.5 ppm FTL with a cost-effective product.

III.

RELAXATION OF THE FTL WILL NOT EFFECT ANY OTHER PORTION OF THE RULING OR RESULT IN DISPARATE IMPACT TO ANY PARTICULAR INTEREST GROUP.

TI/MFS' request is very narrow. The FTL for non-multilateration systems is a distinct portion of the Ruling that is not drafted to be contingent or interdependent upon any other technical limitation. Accordingly, the elimination of the FTL will not impact other sections of the Ruling. More importantly, elimination of the FTL will neither adversely effect non-multilateration providers nor result in disparate impact to the other types of authorized operators in the 902-928 MHz band.

A. Relaxation Of the FTL Provides No Advantage to One Non-multilateration System Provider Over Other Non-multilateration Providers.

Upon information and belief, because no existing non-multilateration AVM system on the market currently complies with the FTL the relaxation of the FTL will not favor one system provider over another. To the contrary, if in fact TI/MFS are wrong and there are existing non-multilateration systems on the market that do comply with the FTL, the adoption of the FTL gives those existing providers an advantage in the market place over other providers who will have to design conforming equipment. If anything, the relaxation of the FTL levels the playing field for all non-multilateration providers in the near term market.

B. Relaxation of the FTL Results in No Disparate Impact to Any Particular Interest Group.

Because there is no significant advantage to be gained by tighter frequency tolerances, no non-multilateration providers sought frequency tolerance restrictions. The record also indicates that with the sole exception of Teletrac, a multilateration provider, no other multilateration provider or Part 15 users sought to impose a frequency tolerance for non-multilateration systems and several parties to the rulemaking noted that such a frequency tolerance did not make sense in the non-multilateration arena. Because the relaxation of the FTL only impacts non-multilateration providers, TI/MFS would not anticipate significant objection to this proposal.

IV.
THE COSTS AND DELAY ASSOCIATED WITH THE FTL WILL
ADVERSELY IMPACT GOVERNMENT, PRIVATE SECTOR AND
PUBLIC INTEREST.

TI/MFS' concerns on behalf of all non-multilateration providers about the impact on the industry are multi-faceted. The concerns may best be lumped into two categories, cost and delay. Due to the current state-of-the-art, the FTL causes the Ruling to impose a disproportionate delay on non-multilateration providers when compared to other types of providers. The delay takes numerous forms. First, there is delay driven by redesign requirements. Second, there is delay occasioned by the need to renegotiate contracts to cover the additional costs. Third, the change in funding requirements will undoubtedly result in additional delays as governmental agencies return to the funding allocation process to seek increased allocations and approvals.

In addition to delay concerns, there are significant costs. There are political costs to the agencies who have been advocates of the AVM technology. There are lost opportunity costs associated with the delays described above. There are direct financial costs directed toward the private sector in requiring new technology development and leaving them exposed on existing open commitments. Last, but of utmost importance, there are significant social costs to the government in lost efficiencies and the public interest in safety, efficiency, and productivity.

A. The Attendant Delay in Development Will Severely Hamper State and National Introduction of State-of-the Art Electronic Toll Collection Systems.

1. The Delay May Adversely Impact Funding Allocations.

The Federal Highway Administration and National Highway Traffic Safety Administration are seeking a \$351 million allocation for the ITS during fiscal year 1996 while the Federal Transit Administration is seeking \$4.2 million. These budget requests, the largest ever for the ITS program, contemplate existing pricing levels. The combination of significant delay in implementation of new systems, increased costs associated with retrofitting near term projects to bring them into compliance and increased costs for new complying systems suggest now that this request figure is understated. Yet, precisely because the request is a record level and the FTL will impede implementation, -- delaying the return on investment-- the FTL places this 1996 Budget Request in jeopardy, by making it a prime target for a Congress eager to find new spending cuts.²

² These concerns are real as noted in a recent issue of Inside IVHS: "FWHA officials hope they can hold aside the money pegged for the Bay area, even though they can't actually obligate the funds unless there's a project underway, Berg says. This could prove difficult, as a cost-cutting Congress targets federal programs with money sitting idle in their coffers. The Senate recently proposed rescinding half of

Additionally, on the state level, budgets have been requested and/or authorized at levels that only contemplate current cost coefficients. To the extent that current authorizations are insufficient to support the FTL and are time limited to expenditure in particular fiscal years, contemplated deployments may lose funding allocations, requiring new rounds of funding approval and additional delays in implementation.

2. The Current Non-conformance of Existing Technology to the 2.5 PPM FTL Will Halt Current Installation Plans Exposing Non-multilateration System Manufacturers to Unnecessary Losses From Pending Commitments Obsolete By The New FTL.

As this Commission has already recognized, there are a substantial number of existing non-multilateration stations in place. As those programs have met with success, there has been increasing interest and market growth. As such, all of the players in the AVM field supplying non-multilateration systems have been undertaking negotiations and making deals to deploy their respective technologies. To assure cost-effective products, undoubtedly there are open commitments for components that may necessarily be obsolete by the new FTL because the components will not allow the systems to function within the tolerance specification. The "fix" for pending installations to comply with the FTL is not as simple as adjusting a screw. The adjustment will entail design modifications, component modifications and resulting processing and quality testing modifications. The ramifications are wide-spread and costly. While it is conceivable that new technology, processes and testing procedures may be developed, non-multilateration providers will be severely hampered in expending such development costs because those currently

the \$100 the FHWA has been authorized to spend on the Congestion Pricing Pilot program for 1992 through 1995" Inside IVHS, Transport Technology Publishing, Vol. 5, No. 8 (April 10, 1995), p. 8.

negotiating for AVM systems cannot be expected to commit resources for near-term projects that are based on either non-conforming technology with the prospect of retrofitting, unproven technology, or conforming technology, that will not be immediately available.

B. The Associated Cost Increase Driven By The Additional Equipment Required to Comply With The FTL Will Substantially Impair the Market.

AVM system clients are looking for cost-effective solutions; the FTL will contract the client base for AVM systems. The FTL will drive up costs to non-multilateration systems manufacturers which necessarily will be passed on to customers. As the costs rise, customers will naturally seek or reconsider investment in non-multilateration products in favor of less expensive technology. This natural tendency will contract the market for AVM systems to the detriment of the entire industry. As interest shifts from one type of technology to another, the incentive for new non-multilateration competitors to enter the market declines. As a consequence, the adverse impact of the FTL may continue to be felt years from now.

The lack of a grandfathering provision for non-multilateration systems regarding frequency tolerance on a going forward basis in the near term adversely impacts state and national interests in deploying systems and increases the cost to the agencies who will now be forced to forego installation until technology is developed. This cost will ultimately be borne by the taxpayer. But, in the meantime, the incentive for governmental agencies to continue current programs to implement AVM technology will be on hold until not just complying technology, but cost-effective complying technology comes forth, a prospect that may be years off.

C. The Delay in Introduction Adversely Impacts ITS Public Interest Concerns.

AVM becomes a very powerful tool when it is used in a well-planned and implemented ETTM system. Such a system will reduce congestion and increase throughput by moving cars through toll areas at highway speeds. By supplying large amounts of traffic flow information, a fully functional ETTM system can evaluate current conditions and provide motorists with a variety of alternatives to make their trip faster and safer. The result is less highway congestion, less air pollution and wasted fuel, reductions in traffic accidents, and increases in productivity as more time is spent at work or home rather than wasted while sitting in traffic.

Delay of the construction of intelligent vehicle highways has certain societal costs. Years ago the Intelligent Vehicle Highway Society of America ("IVHS America") estimated that the annual costs of traffic congestion to the nation in lost productivity is over \$100 billion. While not all of the \$100 billion can be attributable to congestion due to toll systems, certainly hundreds of millions of dollars annually on a national scale can be attributed to such congestion. Those figures have yet to decline. The use of ETTM systems will allow existing highways to be modified to relieve such congestion. These types of productivity savings, particularly in areas of the country that are already suffering from weakened economic conditions, will have a significant impact on the Nation's economic health. Accordingly, delays or setbacks in implementing and deploying ETTM systems, such as will be required by the FTL, will have direct and significant effect on the ability to recover this lost productivity.

This most practical method for avoiding these costs is to relax the FTL. Although, a modified grandfathering provision might alleviate some of the delay, it would do nothing to avoid the negative consequences of the cost increases

V.

THE COMMISSION SHOULD CLARIFY THE CALCULATION OF THE EMISSION MASK.

The emission mask provision of the Ruling is not clear in its application. Specifically, the method of calculation of the emission mask of "at least $55 + 10\log(P)$ dB where P is the highest emission (in watts) of the transmitter inside the authorized bandwidth" needs clarification. For non-multilateration systems which employ directional antennae, the emitted power is not deployed in a 360° radius. Instead, the signal is transmitted to a more limited angle. As a result the power that is emitted as it becomes concentrated in a smaller angle effectively increases. This increase in power due to the limitation of the emission area is called the antenna gain, yielding a power figure with a nomenclature of "Effective Intrinsic Radiated Power" ("EIRP"). Did the Commission mean for the " P " element in the emission mask calculation for non-multilateration--at least $55 + 10\log(P)$ --to be measured by the EIRP? Or, did the Commission mean the power level out of the transmitter feeding into the antennae as the effective power generated by the system?

Second, please confirm our understanding that this calculation really means a power level equal to -55 dBW as the maximum out-of-band emission.³ TI/MFS believe

³ Hughes noted in its comments that it was appropriate for the $10\log(P)$ dB term to actually be negative for transmitter powers below 1 watt. Hughes comment at p.12, n.9.

that if we are correct that the calculation is intended to be negative for transmitter powers below 1 watt, then it would be clearer for the Commission to simply specify a maximum out of band power of -55 dBW for all systems.

VI. CONCLUSION

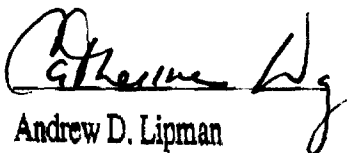
The adverse consequences for the industry associated with delays of the FTL are not outweighed by the nominal gain in interference avoidance offered by the FTL. Moreover, the costs to the industry, the market, governmental interests and the general public are not justified. For these reasons, TI/MFS respectfully request that the FTL be relaxed to a range approximating 50 ppm. In the alternative, TI/MFS request that a grandfathering provision be incorporated into the Ruling that protects these interests until cost-effective complying technology may be available in production levels.

In addition, TI/MFS ask the Commission to clarify the calculation of the emission mask limit.

Respectfully submitted,

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